The theory now proposed is a considerable modification of this view, for it supposes that the rupture of the central body did not take place until it was partially consolidated, and had attained nearly its present dimensions.

I do not pretend, in these remarks, to have thoroughly discussed the cases of the other planets, and have only drawn attention to a few salient features; in the paper itself the subject is considered at greater length. It will, however, I think, be admitted that the theory agrees with some remarkable facts in the solar system.

G. H. DARWIN

THE SEXUAL COLOURS OF CERTAIN BUTTERFLIES

DR. SCHULTE, of Fürstenwalde, has called my attention to the beautiful colours which appear on all four wings of a butterfly, the *Diadema bolina*, when looked at from one point of view. The two sexes of this butterfly differ widely in colour. The wings of the male, when viewed from behind, are black with six marks of pure white, and they present an elegant appearance; but when viewed in front, in which position, as Dr. Schulte remarks, the male would be seen by the female when approaching her, the white marks are surrounded by a halo of beautiful blue. Mr. Butler, also showed me in the British Museum an analogous and more striking case in the genus Apatura, in which the sexes likewise differ in colour, and in the males the most magnificent green and blue tints are visible only to a person standing in front. Again with Ornithoptera the hind wings of the male are in several species of a fine golden yellow, but only when viewed in front; this holds good with *O. magellanus* but here we have a partial exception, as was pointed out to me by Mr. Butler, for the hind wings when viewed from behind change from a golden tint into a pale iridescent blue. Whether this latter colour has any special meaning could be discovered only by some one observing the behaviour of the male in its native home. Butterflies when at rest close their wings, and their lower surfaces, which are often obscurely tinted, can then alone be seen; and this it is generally admitted, serves as a protection. But the males, when courting the females, alternately depress and raise their wings, thus displaying the brilliantly coloured upper surface; and it seems the natural inference that they act in this manner in order to charm or excite the females. In the cases above described this inference is rendered much more probable, as the full beauty of the male can be seen by the female only when he advances towards her. We are thus reminded of the elaborate and diversified manner in which the males of many birds, for instance the peacock, argus pheasant, &c., display their wonderful plumage to the greatest advantage before their unadorned friends.

The consideration of these cases leads me to add a few remarks on how far consciousness necessarily comes into play in the first acquirement of certain instincts, including sexual display; for as all the males of the same species behave in the same manner whilst courting the female, we may infer that the display is at least now instinctive. Most naturalists appear to believe that every instinct was at first consciously performed; but this seems to me an erroneous conclusion in many cases, though true in others. Birds, when variously excited, assume strange attitudes and ruffle their feathers; and if the erection of the feathers in some particular manner were advantageous to a male whilst courting the female, there does not seem to be any improbability in the offspring which inherited this action being favoured; and we know that odd tricks and new gestures performed unconsciously are often inherited by man. We may take a different case (which I believe has been already advanced by some one), that of young ground birds which squat and hide themselves when in danger immediately after emerging from the egg; and here it seems hardly possible that the habit could have been consciously acquired just after birth without any experience. But if those young birds which remained motionless when frightened, were oftener preserved from beasts of prey than those which tried to escape, the habit of squatting might have been acquired without any consciousness on the part of the young birds. This reasoning applies with special force to some young wading and water birds, the old of which do not conceal themselves when in danger. Again a hen partridge when there is danger flies a short distance from her young ones and leaves them closely squatted; she then flutters along the ground as if crippled, in the wonderful manner which is familiar to almost every one; but differently from a really wounded bird, she makes herself conspicuous. Now I is more than doubtful whether any bird ever existed with sufficient intellect to think that if she imitated the actions of an injured bird she would draw away a dog or other enemy from her young ones; for this presupposes that she had observed such actions in an injured comrade and knew that they would tempt an enemy to pursuit. Many naturalists now admit that, for instance, the hinge of a shell has been formed by the preservation and inheritance of successive useful variations, the individuals with a somewhat better constructed shell being preserved in greater numbers than those with a less well constructed one; and why should not beneficial variations in the inherited actions of a partridge be preserved in like manner, without any thought or conscious intention on her part any more than on the part of the mullusc, the hinge of whose shell has been modified and improved independently of consciousness. CHARLES DARWIN

Down, December 16, 1879

NOTES

WE are much pleased to be able to announce that the Committee of the British Association for the Exploration of Socotra have secured the services of Dr. I. B. Balfour, Professor of Botany at Glasgow, as naturalist. Besides many other qualifications for the post Dr. Balfour has recently taken part in the execution of a similar piece of work as one of the naturalists attached to the station for the observation of the Transit of Venus at Rodriguez. Dr. Balfour will leave for Aden on the 9th inst., and proceed thence to Socotra.

M. PERRIER, the head of the French Survey, has been appointed a Member of the Academy of Sciences. It may be remembered that M. Perrier is a commander on the staff, and has just accomplished one of the greatest geodetic feats on record, the connection of the South of Spain with the Algerian province of Oran. M. Perrier is a supporter of M. Roudaire's scheme, and his appointment is considered likely to accelerate the work of the survey for the great Saharan Railway.

WE are pleased to see that a movement is on foot to erect an educational natural history museum in Perth, as a memorial to the late Sir Thomas Moncrieffe, president of the Perthshire Natural History Society. From a statement sent us by Dr. Buchanan White, we notice that the organisers have a rational idea of what such an institution should be, and their scheme is a comprehensive one, having in view the education of the citizens of the ancient burgh, as well as the collection of objects of natural history connected with the county. A generous citizen of Perth, Mr. Robert Pullar, offers 500*l.* of the 2,000*l.* which it is estimated the building will cost.

M. E. LEVASSEUR, a well-known French geographer, has invented an amusing and instructive geographical game, to which he gives the name of "Tour du Monde." It is played on a large terrestrial globe divided into 232 spherical rectangles, each of which has a number, corresponding to a number on a list, indicating gains or losses, in accordance with the nature of the rectangle to which it belongs. The game is played with eighteen flags corresponding to the principal States of the world, from China, the most populous, down to Holland, the least populous. A brass slip, from pole to pole, contains eighteen holes, into which the flags are successively placed by the players at each revolution, commencing at the south pole and moving northwards. The gains and losses correspond with the nature of the facts indicated in the space above which a flag may stand when the globe stops revolving. Thus London counts thirty, Paris twenty, and so on, according to population. A coal-mine, a Manchester cotton factory, a grain centre, all count for gains; while meeting a Zulu or a lion in Africa, a storm in Atlantic or Pacific, a crocodile in the Nile, being caught in the Polar ice, &c., count for losses. Thus it will be seen, the new game is calculated to afford considerable excitement as well as instruction.

DR. B. W. RICHARDSON has been re-elected Assessor of the University Council of St. Andrew's University. This will be Dr. Richardson's third term of office.

WE last week referred to the new appointment to the Registrar-Generalship and the resignation of Dr. Farr. The following is Dr. Farr's dignified and temperate letter to Major Graham, the retiring Registrar-General:—"December 23.—Sir,—Having now heard from you that Sir Brydges Henniker is to be the new Registrar-General, and thus having lost all chance of being your successor, I shall be glad if the Lords of Her Majesty's Treasury will allow me to resign my appointment, and will grant me superannuation allowance to the extent of my full pay. I have served under you nearly forty years, I have taken with you three censuses, and I feel confident that I can leave my case in your hands.—(Signed) William Farr." The Government has possibly a complete justification to give for the appointment of Sir Brydges Henniker; if so, they should lose no time in making it public, as their treatment of Dr. Farr has roused universal indignation.

MR. EDISON publishes through the columns of the *New York Herald*, an elaborate and detailed account of his labours with his new form of electric lighting. Minutely describing the course of his studies, Mr. Edison says that he has made the discovery that the carbon framework of a small piece of paper is the best substance for incandescent lighting. A piece of cardboard, known in the trade as "Bristol," is cut, with a suitable punch, into strips in the form of miniature horseshoes, about 2 inches long, and one-eighth wide. A number of these strips are placed in a wrought-iron mould, separated from each other by tissue paper. The mould, after being well covered, is placed in an oven, where it is gradually exposed to a temperature of about 600° F., so as to allow the volatile portions of the paper to pass away. The mould is then removed to a furnace, kept there till it retains almost a white heat, and subsequently allowed gradually to cool down. On opening the mould, the charred remains of the cardboard must be taken out with great care, in order to prevent them from falling to pieces. They are placed in a small globe and attached to the wires connecting the generating machine. The next thing is to extract the air, by means of the pump, from the globe; that being accomplished, the globe is sealed, and the lamp is ready for use. It should be observed that the new lamp requires no complex regulating apparatus, such as characterised the earlier efforts. In fact, Mr. Edison finds that all previous labour in regard to regulators was practically wasted, and furthermore, that electricity can be regulated with absolute reliability in a manner precisely similar to that in which the pressure of gas is now produced. The system now adopted by Mr. Edison in connecting the wires admits of a given number of lights being extinguished without affecting those of other burners. In the same way as we would shut a certain number of gas burners and permit others to draw a supply from the meter, the electric light can be obtained or shut out. From the description now given it appears that the apparatus primarily used by Mr. Edison was in the shape of a large tuning-fork, constructed in a manner that both ends would vibrate when placed near the poles of the great magnet. Experience has demonstrated the impracticability of that apparatus, and it became necessary to search for other means. One experiment was made after another, which had the tendency to lead gradually to the adoption of the system now employed in the generating machine, and which Mr. Edison terms the Faradaic machine. It is briefly described thus:—Two upright iron columns 3 feet in height, and 8 inches in diameter, covered with coarse wire and resting upon a base, form the magnetic poles. Fixed on an angle, so as to admit a free revolution between the poles, is a cylindrical armature of wood, wound parallel to its axes with fine iron wire. This cylinder is made to revolve rapidly between the magnetic poles, and by means of a belt, driven by an engine, strong currents of electricity are generated in the wire surrounding the armature, and these currents are carried along the wires to the electric lamp.

A CHANGE has taken place in the French Ministry, and M. Freycinet, the Minister of Public Works, has been created Prime Minister by the President of the Republic. M. Varroy and General Farre, two pupils of the Polytechnic School, have been appointed to the Department of Public Works and War Office. It is known that M. Freycinet was educated in the same institution, which has never, since it was created in 1798, given at once so many Ministers to France.

IN the Annual Report of the Royal Botanical Garden at Calcutta for the year 1878–79, Dr. King confirms the opinion he has expressed in former reports regarding the unsuitability of the Para rubber plants for acclimatisation in some parts of India. He acknowledges that plants may be coaxed into growing in conservatories, but considers the species far too thoroughly tropical to withstand without protection the vicissitudes of the climate of Northern India. He says, "I believe it is useless to try it anywhere in India except in the south of Burmah or the Andamans, or perhaps in Malabar. Contrary to the experience with Para rubber, the Ceara Kina (*Manihot glaziovii*) promises well, and if the quality of rubber yielded by it in India proves to be good, its introduction will no doubt turn out of much importance. Seeds of a species of *Landolphia* yielding African rubber have been received at Calcutta from Zanzibar. Dr. King reports upon them as not looking very promising, but thought possibly some of them might grow. Seeds of the mahogany tree have been received at Calcutta in large quantities, and a large number of seedlings have been distributed. The cultivation of this valuable timber tree has been taken up by the Forest Department in the Government Plantation near Chittagong. Large quantities, also, of the seed and seedlings of the *Pithecolobium saman*, or rain-tree, have been distributed; and as the plant grows rapidly and seems to flower and seed freely, it may prove a valuable introduction to India.

THE annual prize of 25,000 francs (1,000*l*.), given by the King of the Belgians for works of a scientific character, is now offered for the year 1881. It will be awarded to the author of the best work on the means of improving sea-ports situated upon low and sandy coasts, such as the Belgian ports. Foreigners as well as Belgian subjects may compete, as the competition is an international one. The works must be sent to the "Ministère de l'Intérieur," at Brussels, before January 1 next. The prize will be awarded by a jury composed of four foreigners and three Belgians, all of whom are nominated by his Majesty.

A PRIZE is offered by the Governor of the Prussian province of Saxony for the best text-book of natural science and agriculture. The exact title is as follows: "Lehrbuch der Naturwissenschaften und der Landwirthschaft zum Gebrauch beim Unterricht in den Ackerbauschulen und landwirthschaftlichen Winterschulen in Sachsen." The competing works must be sent to Dr. Julius Kühne, Professor at the University of Halle. The extent of the book is to be moderate, and should not exceed thirty sheets.

On December 10, 1878, the first cremation was executed at Gotha. We announced the fact at the time. News from that town now states that during 1879 fifteen other cremations were performed. This is looked upon as an extremely satisfactory result for the first year in which the process may be chosen by and for anybody. The time for the complete incineration of the bodies was between one and a half and two and a half hours, therefore about two hours on the average. Besides Gotha, other German towns furnished subjects for cremation, such as Langensalza, Naumburg, Neustadt on the Orla, Leipzig, Dresden, Bamberg, Hanover, Breslau, and Vienna.

One of the *desiderata* of M. Leverrier has been fulfilled. A lectureship of astronomy has been created in Marseilles, and M. Stephan, Director of the Observatory, appointed as lecturer.

M. C. Detaille, of Paris, is organising in France, at the request of Lord Lindsay, a system of astronomical exchanges similar to that suggested in these columns by his lordship for England.

The thaw set in in Paris about 4 P.M. on December 28, just when the partial eclipse of the moon was beginning. The temperature has been increasing almost without interruption. 14° Cent. in the sun has been reached, and 9° Cent. in the shade. The breaking up of the ice in the Seine took place on the 2nd, and was so sudden that it took the engineers by surprise. An immense number of boats have been wrecked, and have created obstacles to the flow of water and ice under the arches of the bridges. The consequence has been the total wreck of the wooden foot-bridge of the Invalides and the destruction of two arches of the stone bridge now building at a distance of a few paces down the river. So serious were the fears entertained by the authorities for the safety of the iron bridges that the traffic was prohibited during the whole of Saturday. The news from the mountainous parts of the Seine basin announce that an immense quantity of water is travelling towards the sea.

While Paris and the whole of France have been recently covered with snow, in a period of exceptional cold, the weather has been comparatively very clement on the summit of the Pic-du-Midi and the snow rare. General Nansouty telegraphed privately as follows to M. Tissandier on December 24:—"We are in distress; we shall presently be unable to find enough snow to make water for the tea and the soup. Send us some snow if Paris has enough."

Since December 13 the temperature of Algiers has been that of spring, the temperature in the shade varying from 6° to 17°, and in the sun of 32° Centigrade; almost no cloud in the sky, and a magnificent sun shining all the day long.

M. W. de Fonvielle has just published a novel under the title of "Neridah" (Hachette and Co.), in which, with considerable ingenuity, he brings the tricks of spiritualistic mediums and the facts of electrical science to bear upon the development of the plot. The scene of the story is in England and India.

Prof. Schäfer will, on Tuesday next, January 13, begin a course of ten lectures on the Physiology of Muscle at the Royal Institution; and Mr. H. H. Statham will, on Thursday next, January 15, give the first of two lectures on Modern Architecture since the Renaissance; at the first Friday evening meeting of the season, January 16, Prof. Dewar will describe his "Investigations at High Temperatures." On Saturday, the 17th, Prof. T. Rupert Jones will give the first of three lectures on Coal.

The officers and engineers appointed to proceed to Algeria for the survey of the Transaharan railway, are leaving Paris by batches. They take with them a number of aneroid barometers specially constructed, which will be verified frequently by boiling water with a hypsometer of verysimple construction.

The earthquake in Switzerland on December 30, 1879, is exciting great interest in scientific circles, and arrangements are being made for accurately measuring the duration of future shocks. The occurrence of a shock at the beginning of the late phenomenal frost and of another at its close is too remarkable to escape notice. The oscillation of Tuesday, though felt at places so far asunder as Chambery and Berne, seems to have been most marked at Geneva, Lausanne, and in the mountains of Bex. At Grion, in Vaud, 3,500 feet above the sea-level, the oscillation lasted five seconds, and was accompanied by a rumbling sound as of subterranean thunder.

The subject of the Wyatt-Edgell Prize Essay of the Sanitary Institute is "The *Range* of Hereditary Tendencies in Health and Disease," not the *Cause.*

The programme for the meetings after Christmas of the Society of Arts has just been issued. Among papers to be read at the ordinary meetings between Christmas and Easter are:—January 21, "Domestic Poisons," by Henry Carr; January 28, "The Future of Epping Forest," by William Paul, F.L.S.; February 4, "Trade and Commerce with Siberia, *viâ* the Kara Sea," by Henry Seebohm; February 11, "The History of the Art of Bookbinding," by Henry B. Wheatley, F.S.A.; February 18, "The Euphrates Valley Railway," by W. P. Andrew; February 25, "The Art of the Silversmith," by W. Herbert Singer; March 3, "The History of Musical Pitch," by Alexander J. Ellis, F.R.S.; March 10, "Recent Advances in the Production of Lambeth Art Pottery," by John Sparkes; March 17, "Buildings for Secondary Educational Purposes," by E. C. Robins, F.S.A. In the Indian Section, Prof. Vambéry, the great Eastern traveller, has undertaken to read a paper on "Russia's Influence over the Inhabitants of Central Asia during the last Ten Years," and he has promised to come over from Buda-Pesth expressly for the purpose. The other papers to be read in this section, for which dates are fixed, are:—January 30, "Herat," by Col. G. B. Malleson. C.S.I.; April 2, "The Best Route for a Line of Railway to India," by Mr. B. Haughton, C.E.; May 7, "Agriculture in India," by Mr. Robertson, Superintendent of the Government Farm, Madras. In the Chemical Sections, Prof. Perry will read a paper on "The Teaching of Physics," on January 22. On February 12 there will be a paper on "Gas Furnaces and Kilns for Burning Pottery," by Herbert Guthrie, C.E. The course of Cantor Lectures during this part of the year will be on the "Manufacture of India-rubber and Gutta-percha," by Thomas Bolas, F.C.S. It will consist of six lectures, the first of which will be given on February 2.

The additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mrs. L. C. Piggott; a Common Ocelot (*Felis pardalis*), a Harpy Eagle (*Thrasäetus harpygia*) from Central America, a Black-tailed Parrakeet (*Polytelis melanurus*) from Australia, purchased; a Tamandua Ant-eater (*Tamandua tetradactyla*), two Naked-throated Bell Birds (*Chasmorhynchus nudicollis*) from Brazil, a Tuberculated Iguana (*Iguana tuberculata*) from South America, two Giant Toads (*Bufo agua*) from Savanilla, deposited.